

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) ~~Method~~ A method performed by an apparatus for transmitting watermark data bits using a spread spectrum, said method including the steps:

- modulating said watermark data bits on an encoder pseudo-noise sequence;
- modulating said modulated encoder pseudo-noise sequence on a carrier frequency;
- determining whether at one or more different candidate frequency band positions in a current frame of said audio signal the energy or amplitude level of said audio signal is such that it can mask one or more, respectively, of said modulated carrier frequencies and, if this is true, notch filtering said audio signal at the corresponding frequency band positions and inserting at this frequency or at each of these frequencies, respectively, said carrier frequency or one of said carrier frequencies, respectively;
- checking at which candidate frequency band positions in a frame following said current frame of said audio signal the energy or amplitude level of said audio signal is such that it can mask one or more, respectively, of said modulated carrier frequencies, and providing information about the locations of these frequency band positions; and
- transmitting or transferring data of said current audio signal frame carrying said watermark data bits together with the information about the locations of the frequency band positions to be used in said frame following said current frame of said audio signal, wherein, in the frame following said following frame, no watermark signal carrier is transmitted in the frequency band or bands which have been occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal.

2. (Currently Amended) ~~Method~~ A method performed by an apparatus for transmitting watermark data bits using a spread spectrum, said method including the steps:

- modulating said watermark data bits on an encoder pseudo-noise sequence;
- modulating said modulated encoder pseudo-noise sequence on a carrier frequency;
- notch filtering a current frame of said audio signal at frequency band positions which are arranged in a pre-defined pattern across the sequence of frames of said audio signal and inserting at this frequency band position or at each of these frequency band positions, respectively, in said current frame of said audio signal said carrier frequency or one of said carrier frequencies, respectively, wherein said pattern is arranged such that in the frame following said current frame no watermark signal carrier is transmitted in the frequency band or bands which have been occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal; and
- transmitting or transferring data of said current audio signal frame carrying said watermark data bits.

3. (Currently Amended) ~~Method~~ A method performed by an apparatus for regaining watermark data bits embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated at encoder side on an encoder pseudo-noise sequence and said modulated encoder pseudo-noise sequence was modulated on a carrier frequency, and wherein at one or more different frequency band positions in a current frame of said audio signal the audio signal was notch filtered and one of said carrier frequencies was inserted instead, and wherein a current audio signal frame carrying said watermark data bits was transmitted or transferred together with information about the locations of the frequency band positions used for said carrier frequencies in a frame following said current frame of said audio signal, wherein, in the frame following said following frame, no watermark signal carrier was transmitted in the frequency band or bands which were occupied in said following frame, in order to

decrease watermark data bit errors caused by echoes following reception of said audio signal, said method including the steps:

- receiving and synchronising said transmitted or transferred audio signal;
- demodulating for a current audio signal frame said carrier frequency or said carrier frequencies, respectively, thereby using said information about the location or locations of the frequency band position or positions used for said carrier frequency or frequencies, respectively, which information was attached to the data for a previous frame of said audio signal;
- convolving said current frame of data of said audio signal with a time-inversed version of the encoder pseudo-noise sequence; and
- determining from the sign of the peak or the peaks of the corresponding convolution result the value of a bit of said watermark data.

4. (Currently Amended) ~~Method~~ A method performed by an apparatus for regaining watermark data bits embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated at encoder side on an encoder pseudo-noise sequence and said modulated encoder pseudo-noise sequence was modulated on a carrier frequency, and wherein at one or more different frequency band positions in a current frame of said audio signal the audio signal was notch filtered and one of said carrier frequencies was inserted instead, whereby said frequency band positions were arranged in a pre-defined pattern across the sequence of frames of said audio signal, wherein said pattern was arranged such that in the frame following said current frame no watermark signal carrier was transmitted in the frequency band or bands which were occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal, said method including the steps:

- receiving and synchronising said transmitted or transferred audio signal;
- demodulating for a current audio signal frame said carrier frequency or said carrier frequencies, respectively, thereby using the information about said pre-defined pattern;

- convolving said current frame of data of said audio signal with a time-inversed version of the encoder pseudo-noise sequence; and
- determining from the sign of the peak or the peaks of the corresponding convolution result the value of a bit of said watermark data.

5. (Currently Amended) ~~Apparatus—~~ An apparatus for transmitting watermark data bits using a spread spectrum, said apparatus including:

- means for modulating said watermark data bits on an encoder pseudo-noise sequence;
- means for modulating said modulated encoder pseudo-noise sequence on a carrier frequency;
- means for determining whether at one or more different candidate frequency band positions in a current frame of said audio signal the energy or amplitude level of said audio signal is such that it can mask one or more, respectively, of said modulated carrier frequencies and which means, if this is true, notch filter said audio signal at the corresponding frequency band positions and insert at this frequency or at each of these frequencies, respectively, said carrier frequency or one of said carrier frequencies, respectively, and which means check at which candidate frequency band positions in a frame following said current frame of said audio signal the energy or amplitude level of said audio signal is such that it can mask one or more, respectively, of said modulated carrier frequencies, and provide information about the locations of these frequency band positions; and
- means for transmitting or transferring data of said current audio signal frame carrying said watermark data bits together with the information about the locations of the frequency band positions to be used in said frame following said current frame of said audio signal, wherein, in the frame following said following frame, no watermark signal carrier is transmitted in the frequency band or bands which have been occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal.

6. (Currently Amended) ~~Apparatus—~~ An apparatus for transmitting watermark data bits using a spread spectrum, said apparatus including:

- means for modulating said watermark data bits on an encoder pseudo-noise sequence;
- means for modulating said modulated encoder pseudo-noise sequence on a carrier frequency;
- means for notch filtering a current frame of said audio signal at frequency band positions which are arranged in a pre-defined pattern across the sequence of frames of said audio signal, which means insert at this frequency band position or at each of these frequency band positions, respectively, in said current frame of said audio signal said carrier frequency or one of said carrier frequencies, respectively, wherein said pattern is arranged such that in the frame following said current frame no watermark signal carrier is transmitted in the frequency band or bands which have been occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal; and
- means for transmitting or transferring data of said current audio signal frame carrying said watermark data bits.

7. (Currently Amended) ~~Apparatus—~~ An apparatus for regaining watermark data bits embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated at encoder side on an encoder pseudo-noise sequence and said modulated encoder pseudo-noise sequence was modulated on a carrier frequency, and wherein at one or more different frequency band positions in a current frame of said audio signal the audio signal was notch filtered and one of said carrier frequencies was inserted instead, and wherein a current audio signal frame carrying said watermark data bits was transmitted or transferred together with information about the locations of the frequency band positions used for said carrier frequencies in a frame following said current frame of said audio signal, wherein, in the frame following said following frame, no watermark signal carrier was transmitted in the frequency band or bands which were occupied in said following frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal, said apparatus including:

- means for receiving and synchronising said transmitted or transferred audio signal;

- means for demodulating for a current audio signal frame said carrier frequency or said carrier frequencies, respectively, thereby using said information about the location or locations of the frequency band position or positions used for said carrier frequency or frequencies, respectively, which information was attached to the data for a previous frame of said audio signal; and

- means for convolving said current frame of data of said audio signal with a time-inversed version of the encoder pseudo-noise sequence, which means determine from the sign of the peak or the peaks of the corresponding convolution result the value of a bit of said watermark data.

8. (Currently Amended) ~~Apparatus—~~ An apparatus for regaining watermark data bits embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated at encoder side on an encoder pseudo-noise sequence and said modulated encoder pseudo-noise sequence was modulated on a carrier frequency, and wherein at one or more different frequency band positions in a current frame of said audio signal the audio signal was notch filtered and one of said carrier frequencies was inserted instead, whereby said frequency band positions were arranged in a pre-defined pattern across the sequence of frames of said audio signal, wherein said pattern was arranged such that in the frame following said current frame no watermark signal carrier was transmitted in the frequency band or bands which were occupied in said current frame, in order to decrease watermark data bit errors caused by echoes following reception of said audio signal, said apparatus including:

- means for receiving and synchronising said transmitted or transferred audio signal;

- means for demodulating for a current audio signal frame said carrier frequency or said carrier frequencies, respectively, thereby using the information about said pre-defined pattern; and

- means for convolving said current frame of data of said audio signal with a time-inversed version of the encoder pseudo-noise sequence, which means determine from the sign of the peak or the peaks of the corresponding convolution result the value of a bit of said watermark data.

9. (Currently Amended) ~~Method~~ The method according to claim 1, wherein one of an energy level and an amplitude level of one of said modulated carrier frequency and one of said modulated carrier frequencies is made such that it is masked by the energy or amplitude level of said audio signal at the corresponding frequency or frequencies, respectively.

10. (Previously Presented) The apparatus according to claim 5, wherein one of an energy level and an amplitude level of one of said modulated carrier frequency and one of said modulated carrier frequencies is made such that it is masked by the energy or amplitude level of said audio signal at the corresponding frequency or frequencies, respectively.